

FLOOD PLAIN INFORMATION

BEAVERHEAD RIVER

DILLON MONTANA

PREPARED FOR
BEAVERHEAD COUNTY

AND

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

BY

DEPARTMENT OF THE ARMY, OMAHA DISTRICT, CORPS OF ENGINEERS, 68102
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BASIN MAP

NO SCALE

PLATE 1

This report describes the flood characteristics of the Beaverhead River from approximately 4 miles upstream to approximately 4 miles downstream from Dillon, Montana. The area subject to flooding by the Beaverhead River within the limits of this report includes residential, commercial, and agricultural lands.

This report was prepared for the guidance of local officials in planning the use and regulation of the flood plain. In addition to accounts of past flooding at Dillon, two potential floods are used to represent degrees of major flooding that may occur in the future. These two floods, the Intermediate Regional and Standard Project Floods, are fully defined in the Glossary and should be given appropriate consideration in planning for safety of development in the flood plain. The two potential floods are shown by flooded area maps that delineate the approximate areas that would be inundated. Flood profiles show the water depths relative to the streambed and an elevation reference is given that can be applied across the width of the valley. Cross sections are presented to indicate ground level across the valley at specified locations and the overlying flood depths. The flood profiles and flooded area data presented are based on existing conditions of the basin, stream and valley when the report was prepared, and are reasonable, not precise, indications of probable occurrences. Possible future improvements to control floods are not a consideration of this report. The information in this report does not imply any Federal interest or authority to zone or regulate use of the flood plains; this is a local responsibility. The report provides a suitable basis for the adoption of land use controls to guide flood plain development, with consideration for environmental attributes, and thereby prevent intensification of loss problems. Since it identifies flood problems the report will stimulate the development of other flood damage reduction techniques such as flood control, removal of obstructions and flood proofing, which might be used in an overall Flood Plain Management (FPM) program.

This report was prepared by the Omaha District, Corps of Engineers, in accordance with the authority granted by Section 206 of the Flood Control Act of 1960 (Public Law 86-645) as amended. The study was requested by the Beaverhead County Commissioners through the Montana Department of Natural Resources and Conservation.

The cooperation of the County Commissioners, the Chamber of Commerce, local civil defense officials, the Dillon Tribune-Examiner, and other public and private individuals and organizations in providing assistance and information was most helpful.

Distribution of the report to officials, agencies and individuals concerned with planning in the area covered is made by the Beaverhead County Commissioners, Dillon, Montana. The Corps of Engineers will provide interpretation and technical assistance, if requested, in application of the report data. Other guidelines available from the Corps of Engineers are a pamphlet, "Guidelines for Reducing Flood Damages" and a booklet, "Introduction to Flood Proofing".

BACKGROUND INFORMATION

SETTLEMENT

The name Beaverhead originates from the journals of the Lewis and Clark Expedition wherein they designated a prominent rock resembling a beaver head located about 13 miles northeast of Dillon as Beaver's Head. This expedition entered what is now Beaverhead County in August 1805 enroute to the Pacific Ocean. Historical documents indicate that the expedition passed this area in two separate parties - an advance party led by Captain Lewis, the other led by Captain Clark. This latter party camped during the night of 13-14 August 1805 near the mouth of a small creek near the present site of Dillon. On the expedition's return trip to St. Louis, Missouri in 1806, a portion of the expedition led by Captain Clark passed the Dillon vicinity in July as they traveled down the Beaverhead River.

The Dillon area was Intermittently frequented by hundreds of men engaged in the trapping of fur-bearing animals, especially beaver, during the next three decades following the Lewis and Clark expedition. The area remained relatively quiet until 1862 when gold was discovered at Bannack, Montana. This discovery and those in the area that followed brought thousands of people through the Dillon area in the 1860's and 70's. Some of these people were engaged in occupations which were conducive to the establishment of permanent residences. In 1865, the first cattle were brought into the Dillon area by Phil Poindexter and William C. Orr. Four years later in 1869, John Bishop and Richard Reynold brought the first sheep to the area. This agricultural setting provided the solid background from which a permanent settlement could spring forth. The coming of the Utah and Northern Railroad into the Beaverhead Valley in 1878 and 1879 prompted local citizens to search for a proper townsite in the valley. This was accomplished on 17 September 1880 when 12 men purchased a 428 acre ranch from Richard Deacon for the purpose of allowing the railroad to build across the ranch - a task not allowed by the previous owner. Thus the sight for the new town had been indirectly selected. The first lot was sold to Mrs. L. Kupler for the sum of \$450. The new town was named Dillon in honor of Sidney V. Dillon, then president of the Union Pacific Railroad. Not long after the formation of

the new town, local people had aspirations of moving the county seat from then declining Bannack to Dillon. An election held in May 1881 moved the county seat to Dillon. In 1884 Dillon became incorporated.

Present day Dillon, which had a 1970 population of 4,548, is the focal point of several ranching valleys. It contains numerous churches, an airport, transportation media, a newspaper, a radio station, and industrial and commercial interests. It is the home of Western Montana College and is surrounded by excellent recreational opportunities.

THE STREAM AND ITS VALLEY

The Beaverhead River is located in the extreme upstream reaches of the Missouri River Basin. It originates at Clark Canyon Dam located approximately 21 miles upstream from Dillon, Montana. This dam impounds waters from Horse Prairie Creek and the Red Rock River thus forming Hap Hawkins Lake. From Clark Canyon Dam, the Beaverhead River flows in a general northeasterly direction until its junction with the Big Hole River near Twin Bridges, Montana. These two rivers form the Jefferson River - one of three rivers which join near Three Forks, Montana to form the Missouri River.

The Beaverhead River Basin is typically a high mountainous area located in extreme southwestern Montana west of Yellowstone National Park and originating along the Continental Divide. Elevations in the basin range from 11,000 feet mean sea level (m.s.l.) at points along the Continental Divide to 4,600 feet m.s.l. near the junction of the Beaverhead River and the Big Hole River. The mountain peaks in the basin are typically rugged and barren while the intervening valleys and lower slopes support good stands of vegetation. The lower valleys are relatively wide and are suited to such agricultural endeavors as the raising of hay crops and wheat with some supplemental irrigation.

The Beaverhead River Basin comprises a total of approximately

5,000 square miles of which 3,390 square miles lie above the downstream limits of the study reach as defined in this report. The following table gives climatological data for the Beaverhead River Basin.

Table 1
Beaverhead River Basin Climatological Data

<u>Location</u>	<u>Mean Annual Precipitation (inches)</u>	<u>July Mean Temperature (° F)</u>	<u>January Mean Temperature (° F)</u>
Upstream Reach (Lima, Montana)	10.85	62.1	16.5
Dillon, Montana Airport	9.55	66.4	20.2

At Dillon, Montana, the highest and lowest temperature ever recorded was 102°F and -40°F^{1/} respectively.

The reach of the Beaverhead River studied in this report is about 13 miles in length measured along the main channel centerline. It begins approximately 4 miles southwest of the Dillon Municipal Golf Course in the N 1/4 of Section 3, T8S, R9W and ends approximately 2 miles northwest of the Dillon Airport in the S 1/2 of Section 33, T6S, R8W. This reach of the Beaverhead River has a well defined channel bordered by a flood plain containing intermittent tree growth adjacent to the river and interlaced with various irrigation canals, sloughs, and abandoned river channels. Table 2 shows the average slope of the Beaverhead River stream bed by reaches.

Table 2
Average Stream Bed Slope of the Beaverhead River

<u>Stream Reach (reference points)</u>	<u>Slope (feet/mile)</u>
1 - 11	12.1
11 - 13	7.9
13 - 18	12.1
18 - 23	20.1
23 - 37	14.8
37 - 41	12.1

^{1/} This does not include winter 1974-1975 which may or may not have changed the lowest recorded temperature.

The depth of the Beaverhead River below bankful when considering the entire study reach ranges from approximately 3 to 7.5 feet with the average depth being around 5 feet. However, between the Big Hole Road (reference point 18) and Old Highway 91 (reference point 31) this depth is somewhat greater ranging from 4.8 to 7.5 feet with an average of about 6.7 feet.

The Beaverhead River flood plain as defined in this report has a fairly uniform width from the upstream limit of the study reach (reference point 1) to Old U.S. Highway 91 (reference point 31). Below Old U.S. Highway 91, the flood plain widens considerably due to the divergence from the Beaverhead River of various ditches and sloughs such as Guidici Ditch, Murray-Gilbert Slough, Selway Slough, and Stodden Slough. Figures 1 through 17 show existing conditions along the study reach.



Figure 1. Looking upstream from about 1/2 mile upstream from reference point 1. September 1974.



Figure 2. Looking upstream from the U.S. Highway 91 bridge (reference point 6).
September 1974.



Figure 3. Looking downstream from the U.S. Highway 91 bridge (reference point 6).
September 1974.



Figure 4. Looking upstream from a point located approximately 600 feet upstream from reference point 16. September 1974.



Figure 5. Looking downstream from a point located approximately 600 feet upstream from reference point 16. September 1974. The right edge of Figure 5 blends with the left edge of Figure 4.



Figure 6. Looking upstream at the Big Hole Road (Park Street) Bridge (reference point 18).
September 1974.



Figure 7. Looking downstream from near reference point 19. September 1974. Note the diversion dam near the center of the photograph.



Figure 8. Looking upstream at the diversion dam referred to in Figure 7.



Figure 9. Looking in a southerly direction across the Beaverhead River flood plain in the vicinity of reference points 25 and 26. The Union Pacific Railroad (reference point 27) is at the left of the photograph. September 1974.



Figure 10. Looking east-southeast across the Beaverhead River flood plain. The Union Pacific Railroad bridge over the Beaverhead River (reference point 27) is at the right of the photograph. September 1974. Note that the right edge of this figure blends with the left edge of Figure 9.



Figure 11. Looking upstream from the Union Pacific Railroad (reference point 27). September 1974. Note the debris.



Figure 12. Looking downstream from the U.S. Highway 91 bridge (reference point 28). September 1974.



Figure 13. Looking downstream from the U.S. Highway 91 bridge (reference point 28). September 1974. Note that the right edge of this figure blends with the left edge of Figure 12.



Figure 14. Looking upstream from the Old U.S. Highway 91 bridge (reference point 31). September 1974.



Figure 15. Looking upstream from the Old U.S. Highway 91 bridge (reference point 31). September 1974. Note that the right edge of figure 15 blends with the left edge of Figure 14.



Figure 16. Looking downstream from the Old U.S. Highway 91 bridge (reference point 31).
September 1974.



Figure 17. Looking downstream from the Old U.S. Highway 91 bridge (reference point 31).
September 1974. Note that the right edge of Figure 17 blends with the left
edge of Figure 16.

DEVELOPMENT ON THE FLOOD PLAIN

Development on the flood plain as defined in this report is primarily associated with the city of Dillon. Little development other than isolated farm or ranch buildings exists on the flood plain upstream from Big Hole Road (reference point 18) and downstream from reference point 37. This area is primarily used for agricultural purposes. However, between Big Hole Road and reference point 23 more concentrated development exists. This development is essentially all scattered residential appearing to be small acreages. Between reference point 23 and the Union Pacific Railroad (reference point 27) little development is apparent. This area appears to still be in agricultural use. Between the Union Pacific Railroad and Old U.S. Highway 91 (reference point 31) some commercial development is present in the form of a mining operation and a campground-cottage development. Downstream from Old U.S. Highway 91 but upstream from reference point 37, the area on the left bank of the Beaverhead River in the vicinity of Selway Slough, Murray-Gilbert Slough, and Guidici Ditch appears to be transitioning as one progresses downstream from strictly agricultural use with only intermittent farm or ranch buildings to residential use in the form of small acreages. Along this same reach of the river but on the right bank little residential development is present. The Dillon sewage lagoon occupies a small portion of the right bank flood plain. Most of this area still remains in agricultural use. Throughout the study reach the flood plain contains streets and roads as well as U.S. Highway 91, Interstate 15, and railroad service provided by Union Pacific.

FLOOD SITUATION

SOURCES OF DATA AND RECORDS

Stream gaging records from United States Geological Survey stream gages on streams in the Dillon vicinity were used to perform the hydrologic analysis for this study. These gages and pertinent data pertaining to each gage are shown in Table 3.

TABLE 3
Stream Gage Data in the Dillon Vicinity

<u>Stream</u>	<u>Gage Location</u>	<u>Drainage Area (Sq. Miles)</u>	<u>Gaging Record</u>
Beaverhead River	1 mile upstream from Barretts, Montana	2737	Continuous since 1907.
Beaverhead River	Dillon, Montana.	2895	August to Sep- tember 1907. October 1950 to September 1952. Continuous from 1963 to 1971.
Beaverhead River	7 miles northeast of Dillon, Montana.	3484	October 1950 to September 1952. Continuous since 1963.
Beaverhead River	14 1/2 miles northeast of Dillon, Montana (Blaine).	3619	Continuous since 1935 except for a brief period in 1948.
Blacktail Deer Creek	12 1/2 miles southeast of Dillon.	312	April 1946 to December 1953. April 1955 to 1966.
Grasshopper Creek	11 miles southwest of Dillon.	348	March 1929 to September 1929. April 1930 to June 1933. October 1945 to December 1953. March 1955 to September 1958. October 1959 to 1974.

Information on past floods was obtained from Corps of Engineers flood records and from past issues of the Tribune-Examiner of Dillon. Photographs used in the report are by Corps of Engineers personnel and from the Tribune-Examiner. The photograph base for the Flooded Areas is composed of aerial photographs from flights made in July 1972 by the Agricultural Stabilization and Conservation Service. Cross section data surveyed in the fall of 1973, was supplied by the Corps of Engineers using services provided by the U.S. Geological Survey. Preliminary information concerning the extension of Interstate 15 southwest from Dillon was provided by the State of Montana Department of Highways. U.S. Geological Survey quadrangle maps with twenty-foot contour intervals were also used in the study.

FLOOD SEASON AND FLOOD CHARACTERISTICS

Flooding along the Beaverhead River at Dillon, Montana normally can occur anytime from January through September. However, mid to late winter and mid to late spring are the predominant times. The winter floods are usually caused by melt of a heavy snowpack during periods of high temperature and are frequently aggravated by the formation of ice jams. Spring floods along the Beaverhead River usually occur due to the melt of a heavy snowpack in the mountains of the basin. This situation is sometimes augmented by heavy rains.

FACTORS AFFECTING FLOODING AND ITS IMPACT

Obstructions to floodflows - Seven roadways varying from county roads to highways to railroads cross the entire Beaverhead River flood plain within the confines of the study reach. The effectiveness of these roadways in becoming flow obstructions depends upon such factors as the bridge opening size, the height of the roadway above the level of the flood plain, the number of piers supporting the bridge, and the amount of debris lodged in the bridge opening. These roadways can also act to divert floodflows if the roadway is elevated somewhat above the flood plain and if the roadway crosses the flood plain at an angle. The severity of this type of floodflow obstruction and diversion depends upon the magnitude of the particular flood event.

Manmade objects such as buildings, cars, fences, diversion dams, as well as trees, brush, and other vegetation located on the flood plain can cause flow obstructions. These items, while remaining in place, not only tend to create higher stages on the flood plain due to reduced flow area and flow blockage but may also create higher localized velocities as the floodwaters flow around specific items. If the floodflows are of such a magnitude so as to dislodge these flow obstructions, flood stages may lower in that localized area, but the debris often accululates at downstream locations creating very serious problems. This floating debris commonly lodges against bridge piers and bridge decks reducing flow area,

or if severe enough, causing complete channel blockage. These situations can cause severe stage and velocity increases accompanied by bridge damage or complete failure.

Ice can also cause a flow obstruction problem similar to that described above for debris. In the Dillon vicinity, channel blockage due to ice occurs rather frequently during the winter months resulting in inundation of the adjacent flood plain.

Flood damage reduction measures - The possibility of future flood damages at Dillon due to the Beaverhead River was reduced in 1964 when the Bureau of Reclamation completed Clark Canyon Dam. This structure, located approximately 20 miles upstream on the Beaverhead River near the junction of the Red Rock River and Horse Prairie Creek, forms Hap Hawkins Lake. It provides 328,900 acre feet of usable storage capacity between the outlet works invert and the maximum water surface. Since this dam provides flood control as well as irrigation and recreation benefits, the entire drainage area of 2321 square miles upstream from the dam is considered to be essentially non-contributing to peak flood discharges developed for the Beaverhead River in this report.

Upstream from Clark Canyon Dam additional storage is provided on the Red Rock River by Lima Reservoir and the Red Rock Lakes. Lima Reservoir, constructed in 1909, is located approximately 7 miles north of Monida, Montana. The Red Rock Lakes, a part of the Red Rock Lakes National Wildlife Refuge, are located about 25 miles east of Lima Reservoir.

Other factors tend to lessen the flood peaks in the reach downstream from Clark Canyon Dam. The factors include various irrigation diversion dams, the most noticeable being the East Bench Unit near Barretts, and the natural flood plain storage of floodwater downstream from Barretts and the Beaverhead Canyon Gateway.

Flood damage reduction at Dillon is achieved to some degree by a dike constructed along the left bank of the Beaverhead River in the vicinity of the Shady Nook Court near reference point 30. This dike, built by local interests, does not provide protection against large floods such as the potential future floods described in this report.

Flood plain zoning can be an effective method of reducing flood plain damages. To date, the city of Dillon does not have the authority to govern development on the flood plain based upon the threat of flooding. Beaverhead County, however, does have this power once a particular flood plain has been defined.

Other factors and their impacts - The potential exists in the Dillon vicinity for flood damages along the Beaverhead River far in excess of any that have occurred in the past. This is due to continued expansion of development onto the Beaverhead River flood plain and to the fact that floods even larger than past floods are possible. Flood damages in the Dillon area are also possible due to flooding along Blacktail Deer Creek - a right bank tributary of the Beaverhead River flowing through Dillon. Additional flood damages are also possible in the event of large amounts of runoff from the numerous small drainage areas bordering the Beaverhead River valley within the confines of this study reach. The flood hazard presented by these streams can be reduced by implementing flood warning systems, flood emergency plans, and sound flood plain management concepts.

Flood warning and forecasting - The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides no specific flood forecasts for the Beaverhead River in the vicinity of Dillon, Montana. The principal flood warning services provided are generalized flash flood watches and flash flood warnings in the event

that local rainfall reports or radar indicate the occurrence of heavy runoff producing rains. This information is issued from the National Weather Service's Great Falls, Montana office. This office provides weather forecasts at least twice daily and special forecasts of severe storms as required. The National Weather Service river district office in Helena issues flood warnings and snowmelt advisories as needed.

Flood fighting and emergency evacuation plans - A task force has been appointed by the Beaverhead County Civil Defense Director to function during flood periods. Responsibilities of this task force are essentially flood fighting and evacuation.

Material storage on the flood plain - Often floatable man-made material stored on the flood plain is washed away during floods to collect at points downstream. The flood plain in the study reach appears to be relatively clear of such materials. Where floatable material is stored on the flood plain, securing it in some fashion will insure against creating an additional flood hazard. Other floatable material such as trees, branches, brush, and logs is clearly evident along the Beaverhead River and on its adjacent flood plain. This type of material is located all up and down the Beaverhead River and its tributaries and can pose serious debris problems during a flood event.

SUMMARY OF HISTORICAL FLOODS

Flooding in the Dillon vicinity has historically been of two distinct types - the ice jam flood occurring in winter and the open water flood occurring in spring and early summer. A review of gaging records on the Beaverhead River near Dillon indicates that the highest annual discharge normally occurs during May and June as a direct result of mountain snowmelt. In most years, this has also resulted in the highest annual stage at gage locations.

Tables 4 and 5 show data collected at two gaging stations on the Beaverhead River near Dillon. A review of this data as well as the hydraulic capabilities of the Beaverhead River indicates that, on several occasions, discharges have been of sufficient magnitude to create flooding in the Dillon vicinity.

Table 4
Annual Peak Discharges for the Beaverhead
River at Barretts, Montana^{1/ 2/}

<u>Date</u>	<u>Discharge</u> (cfs) <u>3/</u>
20 June 1908	3720
10 June 1909	1510
5 March 1910	2170
10 June 1912	3220
13 June 1913	2280
12 June 1915	1660
22 June 1916	2150
16 May 1917	3200
17 June 1921	2070
28 May 1922	2360
5 June 1925	1670
12 June 1927	1550
24 May 1939	1880
28 May 1942	1970
11 June 1942	1970
15 June 1943	1850
10 June 1944	3060
17 March 1947	1570
13 May 1947	1570
10 June 1947	1570
5 June 1948	2150
4 June 1953	1710
25 March 1956	1770
17 June 1957	1530
9 June 1963	1500
19 June 1964	1910

Table 4 (cont'd)

<u>Date</u>	<u>Discharge</u> (cfs)
18 June 1965	1470
27 July 1966	1020
14 July 1967	1000
30 July 1968	996
21 May 1969	1380
13 June 1970	1490
2 June 1971	1540
10 June 1972	1220
27 May 1973	1180
23 June 1974	1210

1/ From U.S.G.S. Gaging Station located 8 1/4 miles southwest of Dillon.

2/ Prior to 1965, only those years having discharges of 1500 cfs or greater are indicated.

3/ Cubic feet per second

Table 5
Annual Peak Stage and Discharge For
The Beaverhead River at Dillon, Montana^{1/} ^{2/}

<u>Date</u>	<u>Gage Height^{3/}</u> <u>(feet)</u>	<u>Discharge</u> <u>(cfs)</u>
21 June 1964	6.63	1740
18 June 1965	5.50	960
1 October 1966	5.39	912
24 June 1967	4.59	505
14 June 1968	4.73	574
1 April 1969	6.22	1390
31 May 1970	5.27	875
29 June 1971	5.47	929

^{1/} From U.S.G.S. Gaging Station located at Dillon on the south line of section 13, T7S, R9W.

^{2/} Does not indicate record prior to 1964.

^{3/} Datum of gage is 5100 feet (from topographic map).

FLOOD RECORDS

Four U.S. Geological Survey stream gaging stations on the Beaverhead River record flood data in the Dillon vicinity. The gages are all described on page 17 . The stream gage located near Barretts, Montana has the longest period of record. Unfortunately, even though this stream gage is relatively close to Dillon, it is only a fair indicator of peak discharge magnitudes at Dillon due to the apparent amount of peak discharge attenuation which occurs just downstream from Barretts. This phenomenon, which can be seen somewhat by comparing Tables 4 and 5, is due mainly to the East Bench Unit located near Barretts and the physical characteristics of the Beaverhead River flood plain downstream from Barretts as discussed on page 20.

FLOOD DESCRIPTIONS

Several floods have undoubtedly occurred on the Beaverhead River in the Dillon vicinity since settlement of the area. However, little historical flood information appears to be available; probably because the area flooded has, until recent times, been almost exclusively rural and little damage was produced. Therefore, the floods described below reflect the available information and not necessarily the most severe floods or all of the floods having occurred in the Dillon vicinity on the Beaverhead River.

January 1937 - Ice jams on the Beaverhead River created flooding in the Dillon area.

June 1944 - Almost daily rainfall in the upper Beaverhead River Basin from 6 to 10 June coupled with considerable runoff from snowmelt caused flooding along the Beaverhead River. Portions of Dillon, Montana were flooded, resulting in damage to a tourist camp and to buildings, machinery, and other property at two farms near the edge of Dillon. Considerable damage was done to the Union Pacific Railroad and to U.S. Highway 91 at intermittent points between Lima, Montana and Dillon. Several Beaverhead County roads and bridges were damaged as well as low agricultural land. Both highway and rail service to Dillon were stopped from 9 to 11 June.

Late May - early June 1948 - Flooding occurred along the Beaverhead River damaging roads and bridges in Beaverhead County.

January - February 1949 - Ice jams on the Beaverhead River caused flooding from 8 January to approximately 25 February at locations 4.5 miles southwest, 11 miles northeast, and 21 miles northeast of Dillon. Ice jammed at constricted points in the channel resulting in overbank flow which froze in successive layers over the adjacent flood plain. Damage was sustained by pasture and hayland. The flooded area was covered by solid ice ranging up to six feet in thickness. Figures 18 and 19 show channel conditions during this period.

30 January - 6 February 1951 - Several days of thawing temperatures followed by sub-zero temperatures caused ice in the Beaverhead River to form and accumulate to such a degree that channel blockage was apparent from the vicinity of U.S. Highway 91 to Point of Rocks (Beaverhead Rock) forcing the river to flow overland. Much of this water also became frozen causing increased flood depths until most of the low lying land in the immediate vicinity of Dillon was flooded. Approximately 40 persons were evacuated because of the high water. Completely inundated were Ned Pilgrim's fox farm, the Shady Nook tourist camp, the U. W. Durant and Tom Lynas ranches, Dillmont Park, as well as several other farms. Water and ice rose to within four feet from the top of rail at the Union Pacific railroad bridge near Dillon but no bridge damage was sustained. No damage occurred to the U.S. Highway 91 bridge or to the Old U.S. Highway 91 bridge near the Shady Nook area. The water rose to 1.7 and 1.9 feet below low steel of these two bridges respectively. Several county roads were impassable due to the floodwaters. Figures 20 through 24 show flooding in the Dillon vicinity due to this flood.

January 1974 - Extremely cold weather during December 1973 created an ice buildup on the Beaverhead River which threatened to flood the area north of Dillon similar to what occurred during the early 1950's. Local civil defense officials, Montana National Guardsmen, and area

residents worked to remove the ice obstructions with dynamite. By the evening of 11 January 1974 the areas in the vicinity of Old U.S. Highway 91 were either inundated or threatened with inundation. An emergency evacuation team set up by civil defense officials was on alert to evacuate residents and trailer homes from the Shady Nook Trailer Court. Fortunately, this was not necessary as the combination of warming temperatures and ice obstruction removal caused the Beaverhead River to drop several feet in the threatened area by 13 January. Figures 25 through 27 show ice obstruction dynamiting operations conducted on the Beaverhead River north of Dillon on 9 January.



Figure 18. Looking upstream from the Old U.S. Highway 91 bridge (reference point 31).
January - February 1949.



Figure 19. Looking downstream from the Old U.S. Highway 91 bridge (reference point 31).
January - February 1949.



Figure 20. Looking upstream at the Union Pacific Railroad bridge (reference point 27). January - February 1951.

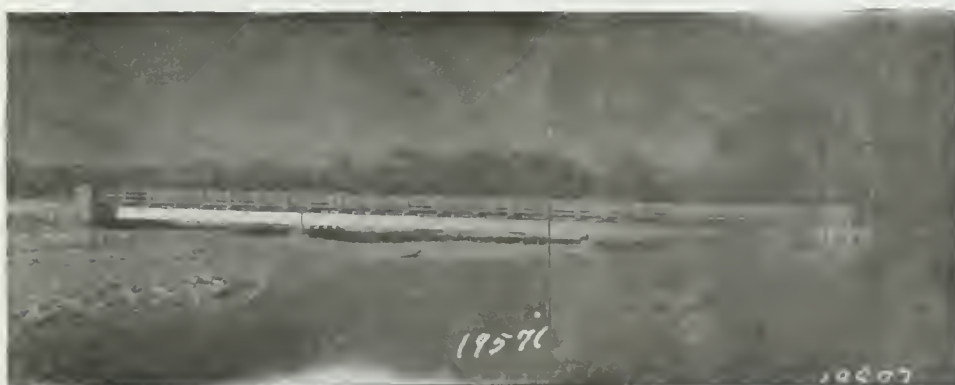


Figure 21. Looking upstream at the U.S. Highway 91 bridge (reference point 28). January - February 1951.



Figure 22. Looking southwest at the Ned Pilgrim fox farm from a point on Old U.S. Highway 91 north of the Beaverhead River. January - February 1951.



Figure 23. Looking north-northwest at the Shady Nook cabin area from a point on Old U.S. Highway 91 north of the Beaverhead River. Old U.S. Highway 91 is at the extreme right of the photograph. January - February 1951.



Figure 24. Looking at the Dillmont Pavillion
located downstream from Old U.S.
Highway 91 on the left bank of
the Beaverhead River.
January - February 1951.



Figure 26.



Figure 25.



Figure 27.

Figures 25, 26, and 27. Dynamiting and removing ice obstructions on the Beaverhead River north of Dillon on 9 January 1974. Figures 25, 26, and 27 show setting the dynamite charge, the explosion, and ice removal. Dillon Tribune-Examiner photos.

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past could occur in the future. To determine the flood potential of the study area, two floods, the Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) were analyzed and the results are presented in this report as a means of demonstrating the effects of large floods. To illustrate that large floods like these can happen, consider the Sun River at Great Falls, Montana on 9 June 1964. On that date the Sun River discharge amounted to an event which frequency was considered to be approximately halfway between that of the IRF and SPF.

INTERMEDIATE REGIONAL FLOOD

The Intermediate Regional Flood is defined as a flood having a one percent probability of occurrence in any year or an average frequency of occurrence of once in 100 years although it may occur in any year. Due to the presence of Clark Canyon Dam, peak discharges for this flood will be produced essentially from the drainage area below the dam. Therefore the peak discharge at various locations in the Dillon area is based essentially upon the stream gaging records for Grasshopper Creek and Blacktail Deer Creek and a comparison of the result of this basis with the Beaverhead River stream gage data at Barretts and at Blaine. The Grasshopper Creek and Blacktail Deer Creek records were statistically analyzed to determine the IRF for each respective stream. This data was then used as a guide in developing similar data for the ungaged drainage area between Clark Canyon Dam and the downstream limit of the study. Flood routing techniques were then used to move the floods down the Beaverhead River picking up floods from the intervening drainage area at the respective locations. Table 6 shows discharge data for both the Intermediate Regional and Standard Project Floods.

Table 6
Discharge Data for the Beaverhead River at Dillon, Montana

<u>Location</u>	<u>Drainage Area (sq. mi.)</u>	<u>Effective^{1/} Drainage Area (sq. mi.)</u>	<u>IRF Discharge (c.f.s.)</u>	<u>SPF Discharge (c.f.s.)</u>
Upstream Limit	2,752	431	2,400	4,100
Above Rattlesnake Cr.	2,753	432	2,400	4,100
Below Rattlesnake Cr.	2,884	563	2,900	5,200
Above Blacktail Deer Cr.	2,895	574	2,800	5,000
Below Blacktail Deer Cr.	3,337	1,016	3,500	6,200
Downstream Limit	3,390	1,069	3,400	5,900

^{1/} The effective drainage area is the amount of flood-producing drainage areas downstream of Clark Canyon Dam.

STANDARD PROJECT FLOOD

The Standard Project Flood is defined as a major flood that can be expected to occur from a severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the study area is located, excluding extremely rare combinations. The Corps of Engineers, in cooperation with the National Weather Service, has made comprehensive studies and investigations based on the past records of experienced storms and floods and has developed generalized procedures for estimating the flood potential of streams. The SPF hydrographs developed for the Beaverhead River were at the same locations as those developed for the IRF. Likewise, similar routing techniques were used. Bear in mind that the SPF is presented in this report as the practical upper limit of flooding. Storms that would produce this flood are uncommon, and it is difficult to assign frequencies of occurrence with any reasonable degree of accuracy.

FREQUENCY

The Standard Project Flood is not the largest flood that can occur but the probability of larger floods becomes increasingly remote. As can be seen from gaging records, discharges smaller than either the Intermediate Regional Flood or the Standard Project Flood are much more common. Ice conditions can create severe flood conditions with relatively little discharge.

HAZARDS OF LARGE FLOODS

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise, and developments on the flood plain. An Intermediate Regional or Standard Project Flood on the Beaverhead River in the study reach would result in the inundation of and subsequent damage to residential, commercial, and agricultural properties. Deep floodwater flowing at high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater two or more feet deep and flowing at a velocity of 3 or more

feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed, or in vehicles that are ultimately submerged or floated. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flooded areas and flood damages - Water surface profiles for the Intermediate Regional and Standard Project Floods were developed for the study reach using the backwater computer program HEC-2, "Water Surface Profiles" developed by the U.S. Army Corps of Engineers. The computations were based on channel and flood plain conditions as represented by surveys conducted in the fall of 1973 and as supplemented by later field investigations.

The Profile on plates 6 and 7, shows the elevation of the water surfaces and water depths relative to the stream bed. The water surface elevations were used to determine flood limits on the cross sections and topographic maps and in turn the flood boundaries were transferred to the aerial photographs. The results are shown on the Flooded Areas, plates 3 through 5. An index to the Flooded Areas plates is on plate 2. Representative cross sections are illustrated on plate 8. The Cross Sections show ground elevations across the valley on both sides of the channel and depths of overbank flooding. Reference points, coinciding with the locations of the cross sections, are shown on the Flooded Areas, Profile, and Cross Sections for correlation between drawings. Table 7 provides data at reference point locations, including distance along the main channel centerline, elevations of the stream bed, and elevations of the Intermediate Regional and Standard Project Floods.

The Flooded Areas show the area that would be flooded by the IRF and SPF. The flood limits were located at each cross section and the intervening flood outlines were drawn based upon available topographic

mapping, engineering judgment, and field observations. It is therefore possible that more or less flooding should be shown on the Flooded Areas. For a specific situation where accuracy of flooded area is required, the flood limits can be more accurately established by determining water surface elevation from the Profile, Cross Sections, or Reference Table and then locating that elevation by survey on the flood plain.

A reference line is shown on the Flooded Areas for the Beaver-head River. This line is used for reference only and does not necessarily coincide with the existing river channel even though it may be referred to as such in the report.

The flood elevations shown on the Profile and in Table 7 apply laterally from the channel over most of the flood plain width. However, road crossings and other topographic features can alter the lateral flood elevations. Depending on whether the features divert or dam flows, the flood elevations at the edge of the flood plain may be higher or lower than at the channel. This condition is illustrated by the cross sections. As an example, cross section 1-1 on plate 8, shows that if the area south and east of the Union Pacific Railroad is developed, consideration should be given to not only the water surface elevation of the main floodflow north and west of the railroad, but also to the floodwaters which are diverted from the main floodflows near reference point 2 and forced to flow on the south and eastside of the railroad. At this particular location elevating the first floor level equal to or higher than the railroad while leaving the adjacent ground low should provide sufficient protection from the flows passing through the area.

Flood plain widths as defined in this report vary considerably from one area to another throughout the study reach. The SPF flood plain width varies from 1400 feet at the upstream limit to 5500 feet near reference point 14 to 2300 feet near reference point 21 to approximately 14000 feet near the downstream limit. These widths include possible

sheet flow areas which are quite large in areal extent as vividly indicated by the Flooded Areas.

The Beaverhead River flood plain in the Dillon vicinity appears to be interlaced with numerous abandoned channels, irrigation canals, and sloughs. These floodwaters spread over broad areas and although shallow in places, flood damages can still accrue.

The right bank sheet flow area located roughly between reference points 9 and 21, is caused by overflow of the Beaverhead River into Poindexter Slough which in turn overflows into the abandoned channels and sloughs north and west of the Union Pacific Railroad. This water will pond in depressions or move in a general northern direction toward the Beaverhead River.

The sheet flow indicated on the right bank between reference points 21 and 26 and east of Interstate 15 and the Interstate 15 access road is a result of water entering the area either via culverts through the Interstate 15 embankment or the Park Street embankment or via groundwater seepage beneath Interstate 15 due to hydrostatic pressure. Water in this area could rise until it attains relief by flowing over the Interstate 15 access road near reference point 25.

Downstream from Old U.S. Highway 91 (reference point 31), extremely large sheet flow areas are shown on both the left and the right bank. Water enters the left bank area mainly by overtopping Old U.S. Highway 91 north of the Beaverhead River bridge although some water escapes the Beaverhead River channel at intermittent points between reference points 31 and 35 and also enters this sheet flow area. Water in this area has a tendency to flow in the lower areas in the vicinity of Selway Slough, Guidici Ditch, and Murray-Gilbert Slough. A similar situation exists on the right bank downstream from reference point 33. Here water escapes the Beaverhead River roughly between reference points 33 and 35 and flows northeastward along such low areas as Stodden Slough.

Throughout the study reach, certain areas have been designated as sheet flow areas to warn that a flood potential does exist. Flooding in the sheet flow area is typically shallow and is expected to cover only a portion of the area so designated during any one flood. The large area was designated as sheet flow since road changes or other activities could easily divert the shallow floodwaters from one location to another in the broad flat areas of the flood plain. Flood elevations in the sheet flow areas would more or less conform to the land elevations over which the water was flowing rather than to flood elevations in the channel and main flood plain. Dissimilarities between the water surface elevations associated with main flood flow and the sheet flow area water surface elevation would generally be in proportion to the distance separating the two features. Because low dikes or roads could easily confine flooding to the channel and main flood plain, the flood elevations were computed as if such conditions existed.

Development is possible in sheet flow areas without high flood hazard if all construction is raised at least 2 feet above the adjacent flood plain while taking special precautions to insure that damage is maintained through the area. Caution should also be exercised to insure that the development site is not located immediately upstream from a roadway or similar obstruction or in a depression which could result in water ponding to depths in excess of 2 feet.

Obstructions to floodflows - Seven roadways, both highway and railroad, cross the entire Beaverhead River flood plain in the study reach. The physical characteristics of these roadways, coupled with the assumption in the hydraulic computations that little debris was lodged in the bridge openings, created conditions in the study which resulted in an increase in water surface elevations immediately upstream from these roadways of one foot or less for all floods studied. This relatively low increase in water surface elevation could increase drastically, especially at those roadways having high embankments, if substantial amounts of debris were to lodge in the bridge opening thus reducing effective floodflow conveying area. If this were to occur during a large flood such as the IRF

or SPF, the increased bridge velocities would cause added erosion around bridge piers and abutments with possible damage. Upstream water surface elevations would also increase because of the debris; possibly flooding more area than shown in this report.

The Union Pacific Railroad, Interstate 15, the Union Pacific Railroad, and U.S. Highway 91 located at reference points 2, 24, 27, and 28 respectively, have roadway embankments of sufficient height to preclude overtopping by the IRF and SPF under the conditions studied in the report. This study shows all water flowing through the respective bridges except at the Union Pacific Railroad, reference point 2. That roadway embankment is skewed with respect to the Beaverhead River flood plain such that some water is diverted from the Beaverhead River channel and flows along the south and east side of the railroad embankment. This water remains on the south and east side of the railroad embankment until it either overtops the railroad embankment or flows through it at some downstream point resulting in the sheet flow described earlier in this report; or it follows Dillon Canal to Blacktail Deer Creek.

U.S. Highway 91, Big Hole Road, and Old U.S. Highway 91, located at reference points 6, 18, and 31 respectively, are overtopped by the IRF and SPF as studied in this report. The relatively low roadway embankments account for this phenomenon. At Old U.S. Highway 91, floodwaters overtopping the roadway contribute to the sheet flow on the flood plain in the vicinity of Guidici Ditch, Murray-Gilbert Slough, and Selway Slough.

Floodflow obstructions are also present in the form of irrigation diversion structures. These structures, by removing floodflow conveying area from the Beaverhead River channel, not only create localized increases in water surface elevation upstream from the structure but force more floodwater to flow on the adjacent flood plain thereby creating higher flood plain velocities.

Ice has been a frequent problem on the Beaverhead River in the study reach. During cold periods in the winter, ice forms on fences crossing the channel, debris in the channel, or diversion dams across the channel. If there is sufficient ice formation, severe channel blockage can occur with ensuing stage increases. In fact, during late January and early February 1951, ice conditions created stages in the Dillon vicinity slightly in excess of those presented in this report for the IRF.

Ice effects were not taken into account in the hydraulic analysis of this report. This is due to the fact that the occurrence and magnitude of ice jams are impossible to predict with any reliability. In order to account for the possibility of future ice effects when considering flood plain development, all development susceptible to flood damages should be located at least 2 feet above the average elevation of the adjacent flood plain or at least 1 foot above the elevation of the IRF, whichever is greater. In the event of complete channel blockage beneath a bridge, the water surface will increase until relief is accomplished by flow over the adjacent roadway. The resultant flood stages may be considerably higher than shown for the IRF necessitating special precautions for construction upstream of roadways.

Velocities of flow - Water velocities during floods depend upon such factors as size and shape of the cross sections, conditions of the stream, and bed slope; all of which vary on different streams and at different locations along the same stream. In the Dillon vicinity along the Beaverhead River, average velocities produced by the Intermediate Regional Flood are 5.5 and 1.0 feet per second for the stream channel and overbank, respectively, while maximum velocities range as high as 9 feet per second in the stream channel and 1.5 feet per second on the flood plain. For the Standard Project Flood, the comparative average velocities are 6 and 1.5, and the maximum velocities are 10 and 2 respectively.

Localized velocities in developed areas or at flow constrictions may be even higher. Water flowing at these rates can inflict severe damage to bridge structures and flood plain development as well as pose a serious hazard to those persons in the path of the moving water.

Rate of rise and duration of flooding - The rate of rise and duration of flooding can vary over a wide range depending upon the source of the floodwaters. If the floodwaters are due primarily to a rainfall event, the rate of rise and duration of flooding is much shorter than if the flood event is due to snowmelt. For the Beaverhead River at Dillon, the length of time from initial rise to peak discharge and the flood wave duration can be expected to be approximately 36 hours and 3 days, respectively, for a flood of rainfall origin. If the flood is due to snowmelt, these values could be extended several days more. In the event of ice effects, peaking time may be extremely short and duration of flooding will vary depending upon the severity of the ice jam.

GLOSSARY OF TERMS

Flood

An overflow on lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river or stream or an ocean, lake or other body of standing water.

Normally a flood is considered as any temporary rise in stream flow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased stream flow, and other problems.

Flood Crest

The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Plain

The relatively flat area or low lands adjoining the channel of a river, stream or water course or ocean, lake or other body of standing water, which has been or may be covered by floodwater.

Flood Profile

A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to shown surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage

The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Head Loss

The effect of obstructions, such as narrow bridge openings or buildings that limit the area through which water must flow, raising the surface of the water upstream from the obstruction.

Intermediate Regional Flood

A flood having a one percent probability of occurrence in any year or an average frequency of occurrence in the order of once in 100 years. The flood may occur in any year. It is based on statistical analyses of stream flow records and analyses of rainfall and runoff characteristics in the general region of the watershed.

Left Bank

The bank on the left side of a river, stream, or water course, looking downstream.

Reference Point

A numbered point identifying a specific location, for correlating the data shown in various forms throughout the report.

Right Bank

The bank on the right side of a river, stream, or water course looking downstream.

Sheet Flow

The water which is diverted from the main floodflow by obstructions and variances in topography. This water flows at shallow depths and

normally at elevations different from the water flowing in the adjacent channel or on the adjacent flood plain. Due to the shallow depths and irregular flow patterns associated with this type of flow, computations to predict flow depth are considered impractical.

Standard Project Flood

The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40 percent to 60 percent of the Probable Maximum Floods for the same basins. Such floods, as used by the Corps of Engineers, are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Top of Waterway

This is the roof of the opening in a stream crossing through which water flows under normal conditions. It is the underside of the deck span - sometimes called "low steel", the roof of a box culvert or the crown of an arched or circular culvert.

Table 7

Flood Plain Reference Data
Beaverhead River, Dillon, Montana

<u>Identification</u>	<u>Reference Point Number</u>	<u>Distance in Feet</u>	<u>Stream Bed Elevation Ft. M.S.L.</u>	<u>Intermediate Regional Flood Elevation Ft. M.S.L.</u>	<u>Standard Project Flood Elevation Ft. M.S.L.</u>
Upstream limits of study	1	68,275	5163.2	5170.7	5171.7
	2	65,200	5157.2	U/S 5164.9	U/S 5165.9
Union Pacific R.R. Bridge				D/S 5164.7	D/S 5165.4
	3	65,070	5158.7	5163.9	5164.7
	4	63,875	5153.4	5160.4	5161.2
	5	62,485	5151.7	5157.7	5159.4
U.S. Hwy 91 Bridge	6	62,380	5151.1	U/S 5157.1	U/S 5158.4
				D/S 5156.6	D/S 5157.4
Cross Section 1-1	7	62,030	5151.5	5155.2	5155.8
	8	59,710	5145.1	5150.3	5151.0
	9	57,750	5139.5	5144.9	5145.6
	10	54,500	5132.7	5137.3	5138.1
	11	51,920	5127.9	5133.9	5134.7
	12	48,290	5122.6	5129.6	5130.3
	13	45,175	5117.9	5123.4	5124.2
	14	43,215	5112.9	5119.3	5120.2
	15	41,300	5109.8	5115.4	5116.3

Table 7 (continued)
Flood Plain Reference Data
Beaverhead River, Dillon, Montana

Identification	Reference Point Number	Distance in Feet	Stream / Bed Elevation Ft. M.S.L.	Intermediate Regional Flood Elevation Ft. M.S.L.	Standard Project Flood Elevation Ft. M.S.L.
Cross Section 2-2	16	38,245	5102.4	5109.3	5110.2
	17	36,420	5098.0	5104.5	5105.5
	18	35,890	5096.6	U/S 5103.9 D/S 5103.5	U/S 5104.9 D/S 5104.5
	19	35,640	5095.5	5102.6	5103.4
Interstate 15 Bridge	20	34,080	5089.5	5096.2	5097.3
	21	32,615	5084.5	5091.1	5092.1
	22	31,670	5080.2	5087.4	5088.8
	23	30,000	5075.5	5082.6	5083.2
Cross Section 3-3	24	28,000	5067.2	U/S 5076.8 D/S 5076.6	U/S 5078.3 D/S 5078.0
	25	26,220	5067.1	5071.4	5072.7
Union Pacific R.R. Bridge	26	24,330	5061.0	5066.9	5069.0
	27	24,180	5060.8	U/S 5066.6 D/S 5066.4	U/S 5068.3 D/S 5067.8
	28	24,080	5060.3	U/S 5066.0 D/S 5065.9	U/S 5067.2 D/S 5067.0

Table 7 (continued)
Flood Plain Reference Data
Beaverhead River, Dillon, Montana

<u>Identification</u>	<u>Reference Point Number</u>	<u>Distance in Feet</u>	<u>Stream I/ Bed Elevation Ft. M.S.L.</u>	<u>Intermediate Regional Flood Elevation Ft. M.S.L.</u>	<u>Standard Project Flood Elevation Ft. M.S.L.</u>
	29	23,890	5058.7	5065.6	5067.0
	30	22,610	5055.3	5062.2	5063.7
Old U.S. Hwy 91 Bridge	31	22,485	5054.5	U/S 5061.6	U/S 5063.3
				D/S 5061.1	D/S 5062.1
	32	21,675	5053.0	5059.4	5060.4
	33	20,090	5049.7	5054.5	5055.4
	34	19,025	5046.2	5052.0	5053.2
	35	15,940	5036.9	5043.4	5044.7
	36	14,115	5034.0	5039.5	5040.5
	37	11,700	5027.8	5033.1	5034.0
	38	9,790	5019.9	5026.2	5027.2
	39	5,930	5013.1	5019.6	5020.7
	40	3,020	5004.1	5011.8	5013.0
	41	0	4998.3	5003.5	5004.6

I/ Approximate elevation



BEAVERHEAD RIVER BASIN
DILLON, MONTANA
**BEAVERHEAD RIVER
PLATE INDEX MAP**

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



NO SCALE

BEAVERHEAD RIVER BASIN
DILLON, MONTANA
**BEAVERHEAD RIVER
PLATE INDEX MAP**
U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



LEGEND:

- INTERMEDIATE REGIONAL FLOOD
- STANDARD PROJECT FLOOD
- Channel and Valley Cross Section
- Reference Point - Also locations of surveyed cross sections

NOTES:

- For the location of this plate, see Plate Index Map (Plate 2).
- For Illustrated Cross Sections, see Plate 8.
- For Profile, see Plate 6.
- For flood elevations at the reference points, see Table 7



BEAVERHEAD RIVER BASIN DILLON, MONTANA BEAVERHEAD RIVER FLOODED AREAS

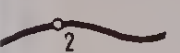
U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



LEGEND:

 INTERMEDIATE REGIONAL FLOOD } STANDARD PROJECT FLOOD

 Channel and Valley Cross Section

 Reference Point - Also locations of surveyed cross sections

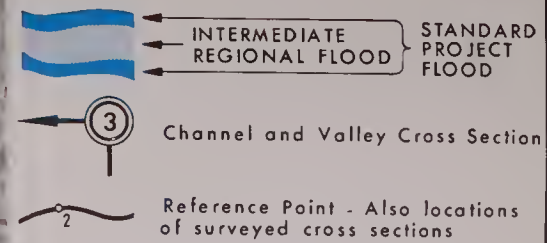
- NOTES:
- 1. For the location of this plate, see Plate Index Map (Plate 2).
 - 2. For Illustrated Cross Sections, see Plate 8.
 - 3. For Profile, see Plates 6 & 7.
 - 4. For flood elevations of the reference points, see Table 7.



BEAVERHEAD RIVER BASIN
DILLON, MONTANA
BEAVERHEAD RIVER
FLOODED AREAS
U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



LEGEND:



NOTES:

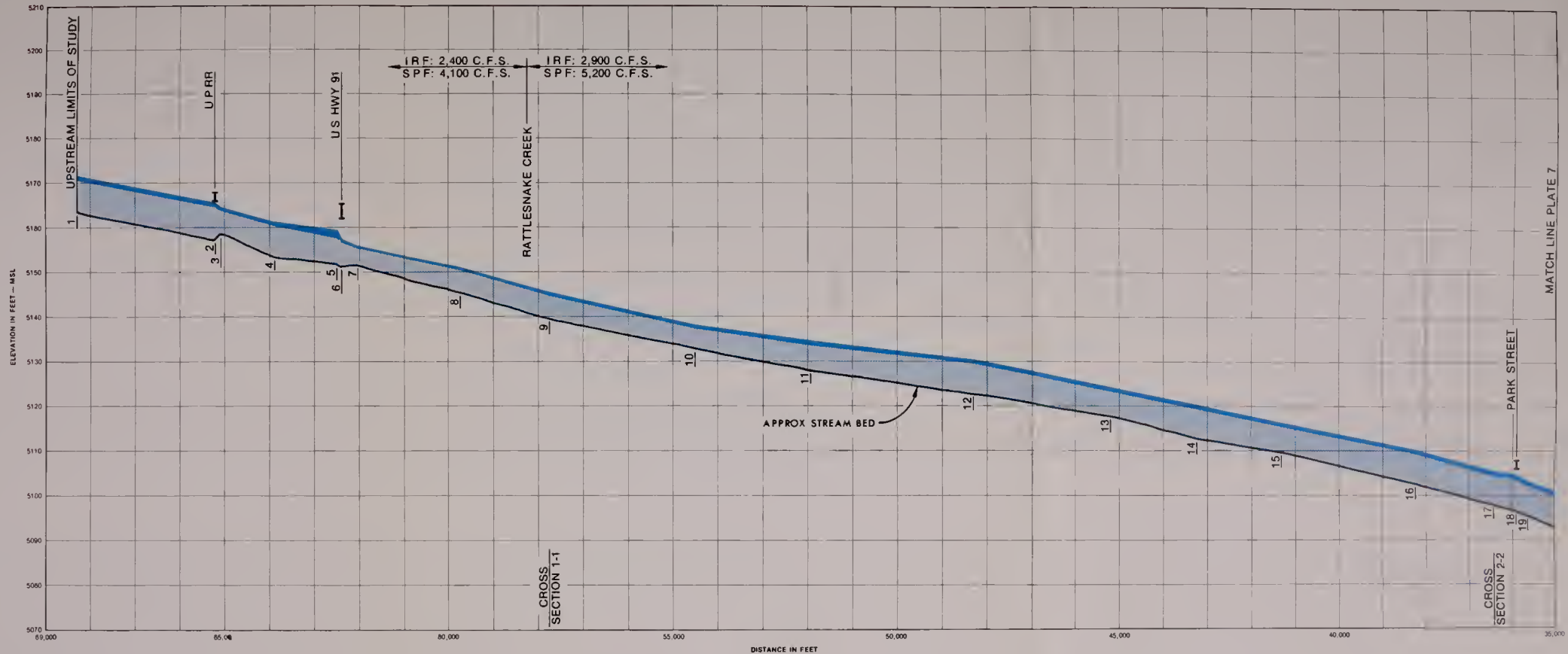
1. For the location of this plate, see Plate Index Map (Plate 2).
2. For Illustrated Cross Sections, see Plate 8.
3. For Profile, see Plate 7.
4. For flood elevations at the reference points, see Table 7.



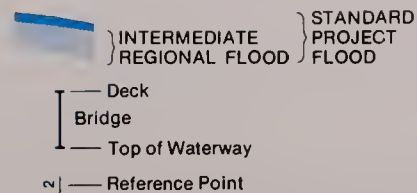
BEAVERHEAD RIVER BASIN
DILLON, MONTANA

**BEAVERHEAD RIVER
FLOODED AREAS**

U. S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



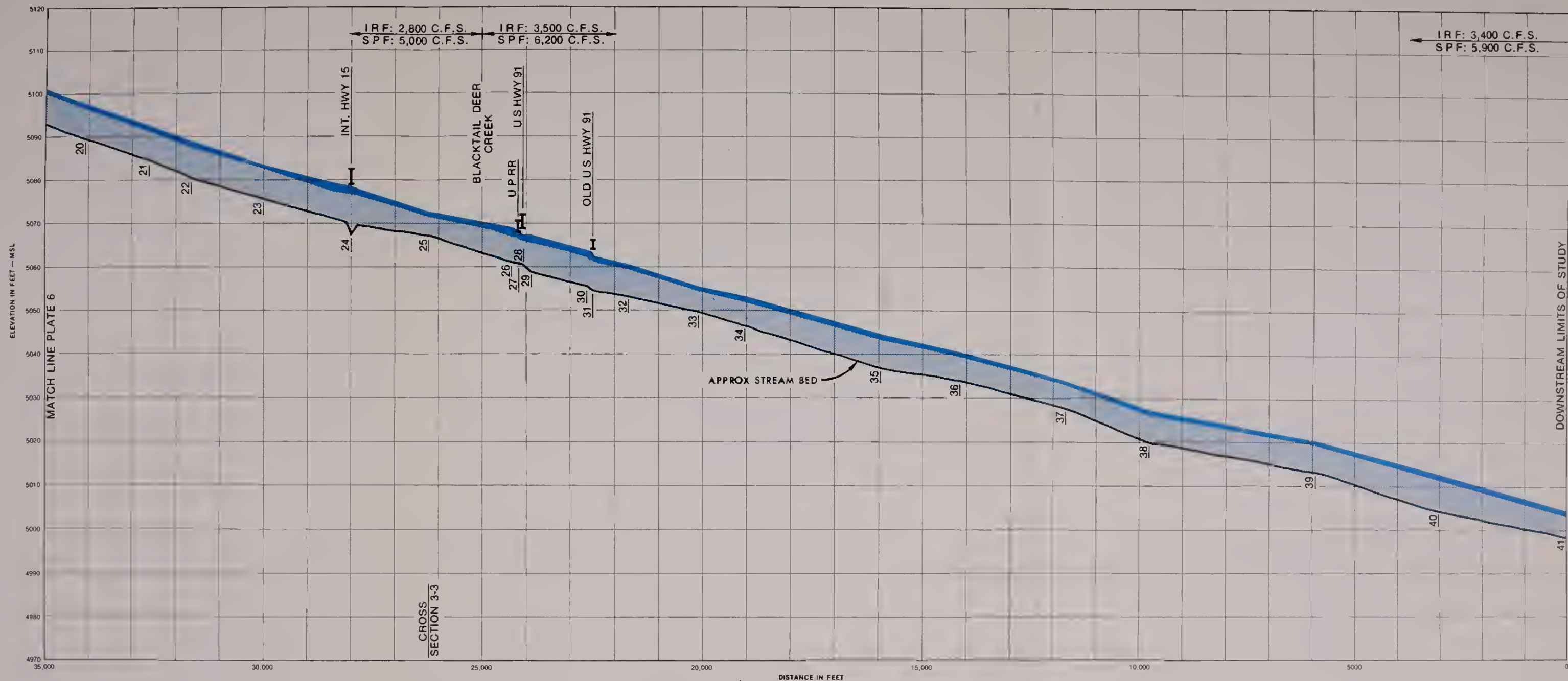
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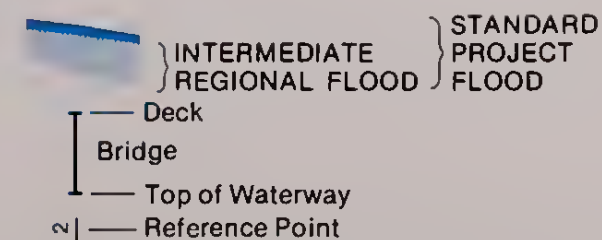
NOTES:

1. For location of Cross Sections, see Plates 3 & 4.
2. For Illustrated Cross Sections, see Plate 8.
3. For flood elevations at the reference points, see Table 7.

BEAVERHEAD RIVER BASIN
DILLON, MONTANA
BEAVERHEAD RIVER
PROFILE
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



LEGEND:

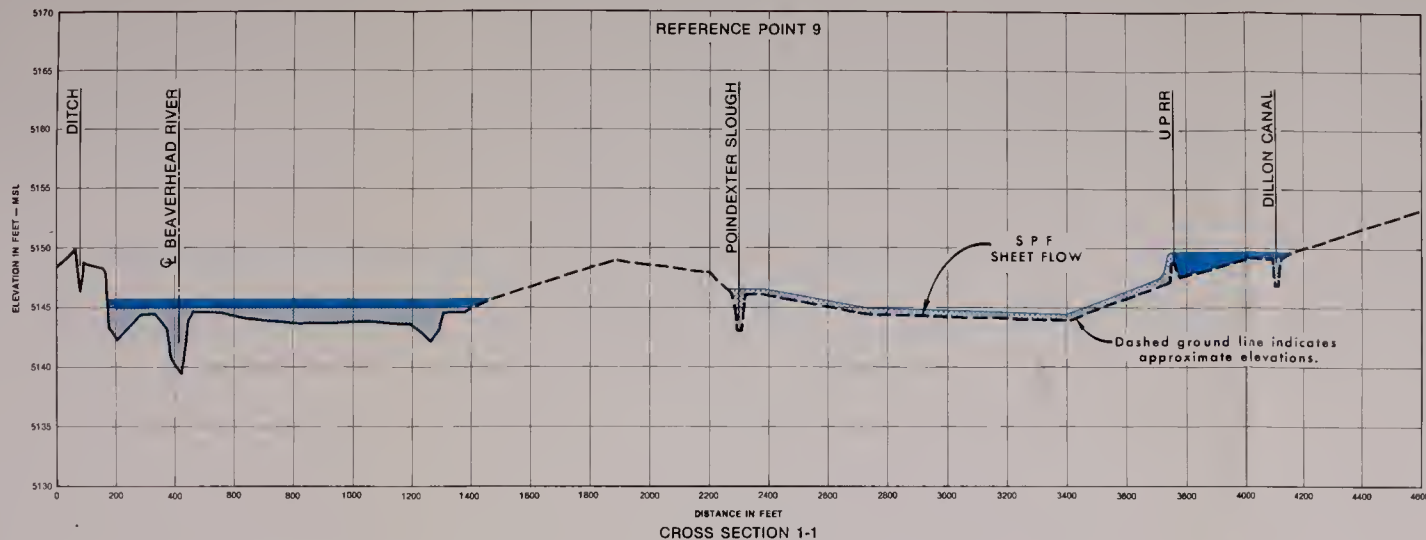


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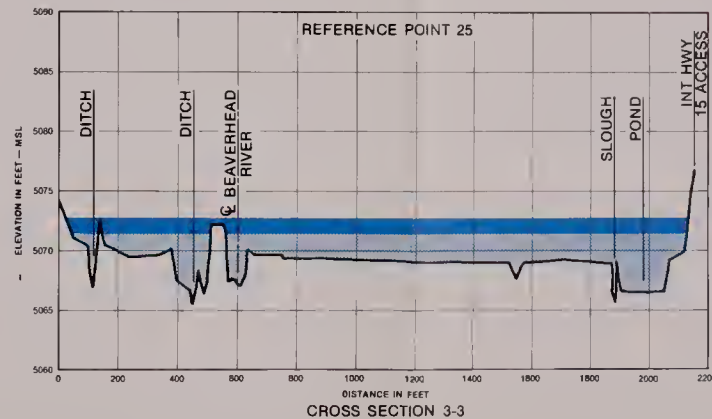
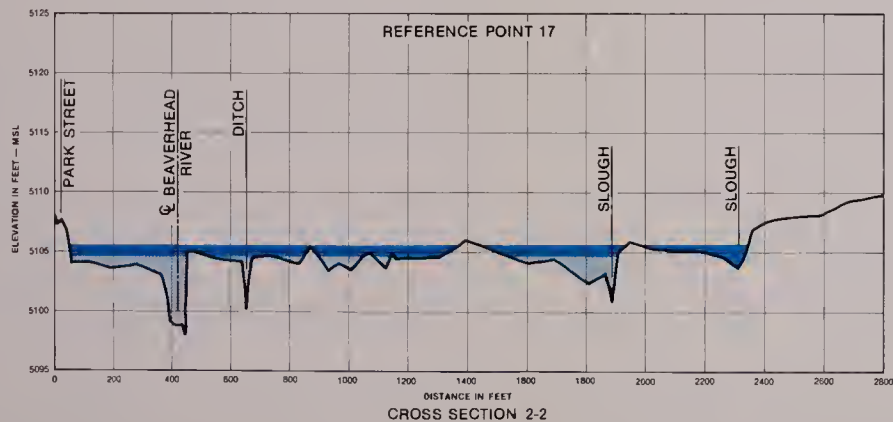
1. For location of Cross Section, see Plate 4.
2. For Illustrated Cross Section, see Plate 8.
3. For flood elevations at the reference points, see Table 7.

BEAVERHEAD RIVER BASIN
DILLON, MONTANA
BEAVERHEAD RIVER
PROFILE

U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975



- NOTES:
1. For location of Cross Sections, see Plates 3 & 4.



BEAVERHEAD RIVER BASIN
DILLON, MONTANA
BEAVERHEAD RIVER
CROSS SECTIONS
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA
JUNE 1975

